

REMARKS

I. Introduction

Pending claims 8-12 and 17-23 stand rejected. Specifically, claims 8-9, 11-12 and 17-23 stand rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Lee et al., U.S. Patent No. 5,459,501 (hereinafter "Lee"). Additionally, claim 10 stands rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Lee in view of Busse et al., U.S. Patent No. 5,359,760 (hereinafter "Busse").

Applicants traverse the art rejections as follows.

II. Claim Rejections -- 35 U.S.C. § 102(b)

Claim 8

The Examiner alleges that claim 8 is anticipated by Lee. Applicants respectfully disagree. The ink-jet print head described in Lee does not disclose or suggest all of the features of the method of manufacturing of claim 8.

For example and not by way of limitation, claim 8 recites the steps of "forming a plurality of channels in one side of a silicon monocrystalline substrate" and "forming an oscillating plate film on the bottom each channel". The Examiner alleges that the ink channels 26 of Lee and the insulating/passivating layer 48 discloses these recited features. To the contrary, in Lee, the insulating/passivating layer 48 is formed on the substrate 32 before the ink channels 26 are formed in the substrate 32 (Lee: col. 5, lines 8-11 and 35-38; Figs. 6 and 8). Indeed, the ink channels 26 of Lee extend through the substrate 32 as well as the insulating/passivating layer 48

(Lee: Fig. 8). Therefore, Lee does not disclose and cannot possibly suggest "forming an oscillating plate film on the bottom of each channel", as recited in claim 8.

Furthermore, claim 8 recites the step of "forming a piezoelectric thin-film element which comprises a piezoelectric film sandwiched between upper and lower electrodes, on the oscillating plate film". The Examiner alleges that Lee discloses these features as forming a piezoelectric layer 44 on the insulating/passivating layer 48. To the contrary, in Lee, the piezoelectric layer 44 is formed before the insulating/passivating layer 48 (Lee: col. 4, lines 58-65; col. 5, lines 8-11; and Figs. 4 and 6). Consequently, Lee does not disclose or suggest "forming a piezoelectric thin-film element . . . on the oscillating plate film", as recited in claim 8.

Further still, claim 8 recites the step of "forming pressuring chambers in the opposite side of the silicon monocrystalline substrate so as to be opposite to the channels, respectively". The Examiner alleges that Lee discloses these features at col. 5, lines 40-65. To the contrary, Lee describes bonding together a first substrate 32 (corresponding to an ink drive unit 14) and a second substrate 56 (corresponding to an ink reservoir unit 12) (Lee: col. 4, lines 29-33; col. 5, lines 48-50; Figs. 2, 9 and 12). Thus, even if these distinct substrates 32 and 56, which are bonded together after processing, are viewed as the recited silicon monocrystalline substrate, Lee fails to disclose or suggest "forming pressure chambers in the opposite side of the silicon monocrystalline substrate so as to be opposite to the channels, respectively", as recited in claim 8. Indeed, in Lee, substrates 32 and 56 are bonded together with sides 34 and 58 thereof in a face-to-face relationship, such that cavity 66 is not formed in an opposite side of the substrate as the ink channels 26 (Lee: col. 6, lines 13-16; Fig. 12).

For at least these exemplary reasons, claim 8 is not anticipated by Lee.

Claims 9 and 11-12

Claims 9 and 11-12 are not anticipated by Lee at least by virtue of their dependency.

Claims 17-19

The Examiner alleges that claim 17 is anticipated by Lee. Applicants respectfully disagree. Lee fails to disclose or suggest a method of manufacturing relating to "a plurality of pressurizing chamber substrates on a silicon monocrystalline substrate, each pressurizing chamber substrate having a plurality of pressurizing chambers formed on one side thereof", as recited in claim 17. Such silicon monocrystalline substrate (wafer) 10 having a plurality of pressurizing chamber substrates 1 is illustrated in Applicants' Fig. 10. Lee does not disclose or suggest any method of manufacturing an ink-jet printing head from such a wafer.

Consequently, Lee fails to disclose or suggest the features of claim 17. For example and not by way of limitation, claim 17 recites "making a recess formation including the steps of, partitioning the silicon monocrystalline substrate into unit areas to be used in forming the pressurizing chamber substrate, and forming a recess in the side of the pressurizing chamber substrate in which the pressuring chambers are to be formed, for each unit area so as to leave a peripheral area along the circumference of the recess".

The Examiner's reliance on the ink channels 26 and air channels 24 of Lee is misplaced, as these channels do not correspond to partitioning the silicon monocrystalline substrate into unit areas to be used in forming the pressurizing chamber substrate, which has a plurality of pressurizing chambers formed on one side thereof. Likewise, the Examiner's reliance on the

aperture 70 connecting the cavity 66 to the nozzle 20 in Lee is misplaced, as these elements of Lee do not correspond to forming a recess in a side of the pressurizing chamber substrate in which the pressurizing chambers are to be formed, for each unit area so as to leave a peripheral area along the circumference of the recess (*c.f.*, Applicants' Fig. 10). Additionally, the Examiner's reliance on the direction 74 that ink droplets are ejected through a nozzle 20 (Lee: Fig. 12) is misplaced as this direction does not correspond to forming pressurizing chambers in the recess formed in the recess making step of claim 17.

For at least these exemplary reasons, claim 17 is not anticipated by Lee. Likewise, claims 18 and 19 are each directed to "a method of manufacturing an ink-jet printing head having a plurality of pressurizing chamber substrates formed on a silicon monocrystalline substrate, each pressurizing chamber substrate having a plurality of pressurizing chambers formed on one side thereof" and are not anticipated by Lee based on a rationale analogous to that set forth above for claim 17.

Claims 20-23

Claims 20-23 are not anticipated by Lee at least by virtue of their dependency.

III. Claim Rejections -- 35 U.S.C. § 103(a)

Busse fails to cure the exemplary deficiencies of Lee set forth above with respect to claim 8. Consequently, claim 10 is patentable over a reasonable combination of Lee and Busse, if any, at least by virtue of its dependency.

IV. New Claims 24-51

Applicants add new claims 24-51 to obtain an expanded scope of protection.

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Application No. 09/599,400
Attorney Docket No. Q59177

V. Drawings

The Examiner objects to Figs. 20 and 21 indicating that these figures should be designated with a legend such as --Prior Art-- as set forth in MPEP § 608.02(g). Applicants are filing concurrently herewith a Submission of Substitute Drawings for Figs. 20 and 21 including Prior Art legends, thereby overcoming the Examiner's objection to the drawings.

VI. Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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